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the field for the purpose of making collections, and pursuing some investigations upon the relations of climate and vegetation, and will continue both lines of work at the Station; the botanical work during the season will be under his guidance. Attention will be given to general botany, and to the special features of the flora of Montana. Mr. R. S. Williams, of the same institution, will spend the month of June in making collections in the northwestern part of the State, and will be present during a part of the session, giving especial attention to mosses and ferns.

No tuition fees are charged either to students or investigators; microscopes and glassware are supplied free, but the worker is expected to meet the cost of material actually consumed.

Applications and correspondence should be addressed to the Director, Professor Morton J. Elrod, Missouli, Mont., until July 10th; after this date to the Biological Station, Holt, Flathead Co., Mont.

SYNTONIC WIRELESS TELEGRAPHY.

At a meeting of the Society of Arts, on May 15th, Mr. Marconi read a paper on 'Syntonic Wireless Telegraphy.' In the course of his paper, according to the report in the *London Times*, he gave an account of two methods by which he has been able to arrange a selective action in his instruments, so that, for example, two stations can converse with each other without being overheard by an intermediate one. In the first he employed an ordinary vertical radiator placed near an earthed conductor, the effect of the latter being to increase the capacity of the radiating vertical wire without increasing its radiative power; in this way syntonic results were obtained without difficulty. In one form of this arrangement the radiating and resonating conductors consisted of a cylinder, the earthed conductor being placed inside. Using cylinders of zinc only seven meters high and $1\frac{1}{2}$ meters in diameter, good signals were obtained between St. Catherine's Point and Poole (50 kilometres distance), which were not interfered with or read by other wireless-telegraph installations at work in the immediate vicinity. The closely adjacent plates and large capacity of the receiver caused it to be a

resonator with a very decided period of its own, and, therefore, it was not apt to respond to frequencies differing from its own period, or to be interfered with by stray ether waves, such as were sometimes caused by atmospheric disturbances, and occasionally proved troublesome in the summer. His second syntonized system was the outcome of experiments with the discharge of Leyden jar circuits. Taking for granted that the chief difficulty with the old system lay in the fact that the oscillations were very dead-beat, he tried, by associating with the radiator wire a condenser circuit known to be a persistent oscillator, to set up a series of persistent oscillations in the transmitting vertical wire. In one application of this principle the vertical conductor was connected to earth through the primary of a transformer, the secondary of which was in circuit with the coherer, and, in order to make the tuning between these two circuits more marked, an adjustable condenser was placed across the coherer. To obtain the best results, it was necessary that the free period of electrical oscillations of the vertical wire primary of the transformer should be in electrical resonance with the secondary of the transformer which included the condenser. It was easy to understand that, if there were several receiving stations, each tuned to a different period of electrical vibration, of which the corresponding inductance and capacity at the transmitting station were known, it would not be difficult to transmit to any one of them without danger of the message being picked up by the others for which it was not intended. But, further, it was possible to connect to the same vertical sending wire, through connections of different inductance, several differently tuned transmitters, and to the receiving vertical wire a number of corresponding receivers; then different messages could be sent by each transmitter to the radiating wire simultaneously, and received simultaneously by the vertical wire connected to differently tuned receivers. A further improvement had been obtained by the combination of the two systems described in the paper, the cylinders being connected to the secondary of the transmitting transformer and the receiver to a properly tuned induction coil, with

all the circuits tuned to the same period. The fact that signalling had been successfully carried out over a distance of 50 kilometers with a cylinder only 1.25 meters high and one meter in diameter led to the possibility of constructing portable apparatus for use in the field. He had designed a complete installation on a steam motor-car, on the roof of which was placed a cylinder, only six or seven meters high, that could be lowered while traveling. By means of this, communication had easily been carried on with a syntonized station 50 kilometers distant, a 25-cm. spark induction coil, taking about 100 watts, being used for transmitting. A strip of wire netting dragged behind the car was sufficient for earth connection, or in lieu of any earth connection the electrical capacity of the boiler might be utilized. As to the distance over which signalling had been effected, last spring he established a station at the Lizard and opened communications with St. Catherine's—a distance of over 300 kilometers. The amount of energy used in this case was not more than 150 watts, and the aerial conductor consisted of four parallel vertical wires $1\frac{1}{2}$ meters apart and 48 meters long, or of a strip of wire netting of the same length. In conclusion, Mr. Marconi gave some examples of the progress made in the practical utilization of his system, and also briefly examined a method proposed by Professor Slaby.

WIRELESS TELEGRAPHY IN THE NAVY.

ADMIRAL BRADFORD, chief of the naval bureau of equipment, has given out the following extract from the report of the board which has investigated the question of transmitting messages by wireless telegraphy:

"From the examination of the subject, as outlined in the orders of the department, the board makes the following recommendations:

"1. That the use of homing pigeons be discontinued as soon as wireless telegraphy is introduced into the navy.

"2. That, pending such action, no new pigeon codes be established.

"3. That wireless telegraphy be adopted by the navy for transmission of messages between distant points.

"Referring to the last recommendation, the

board is of the opinion that a high degree of special electrical training is demanded for the successful operation of any system of wireless telegraphy, and it therefore suggests as necessary the establishment of two stations sufficiently far removed from each other for the training of officers and men.

"In its opinion this requirement would be best met by the establishment of such stations at the Navy Yard, Washington, and the Naval Academy, Annapolis. If wireless telegraphy fulfills what now seem to be its possibilities, the cadets should be thoroughly trained in it.

"As the investigation made by this board is not technical, there being no apparatus of any kind ready for test, but general in its character, such partial examinations as outlined above would not change the recommendations already made.

"The selection of any special system of wireless telegraphy is, in the opinion of the board, very largely a matter of business detail.

"If for any reason any competitive test of different systems is thoroughly desirable the board recommends, in view of the fact that the improved Marconi apparatus will not be available for several months, and that improvement in other systems may occur in that interval, that it be made only after due notice and preparation therefor, and by a special board of experts appointed for the purpose."

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

ARRANGEMENTS for the Denver meeting of the American Association for the Advancement of Science are locally assuming very definite shape. A meeting of the Colorado Science Teachers Association was held in Denver on May 11th and all the members of the American Association residing in Colorado were invited to attend, a special point being made in the call that the meeting would consider the August meeting of the American Association. The cooperation of the Society was pledged to the Local Executive Committee, and the committee itself was organized by the election of Mr. George Lyman Cannon as chairman and Mr. Arthur Williams, secretary of the Chamber of Commerce and Board of Trade, as secretary.